

What is claimed is:

1. A method for sharing bandwidth by a plurality of devices in at least one of a wireless personal area network and a local area network, comprising the steps of:
  - sending from a coordinator a beacon including coordination information to each of the plurality of devices, the beacon including for each of the plurality of devices
    - a device-unique start time indicator corresponding to an exclusive guaranteed time slot for a preselected device of the plurality of devices to transmit data,
    - a transmission duration corresponding to a duration of the exclusive guaranteed time slot, and
    - a shared time slot start time indicator corresponding to a shared time slot separate from the exclusive guaranteed time slots and shared by the plurality of devices;
  - receiving the beacon by the plurality of devices;
  - storing the device-unique start time indicator and the transmission duration in a memory of each preselected device;
  - sleeping after the storing step such that the plurality of devices are not receiving data and not transmitting data while sleeping;
  - transmitting, by each of the plurality of devices, at respective times corresponding to the device-unique start time stored in the memory of each preselected device and for the transmission duration stored in the memory of the preselected device;
  - returning to sleep, after the transmitting step such that the plurality of devices are not receiving data and are not transmitting data while sleeping; and
  - waking up at a predetermined time such that another beacon can be received by the plurality of devices, wherein
    - each device-unique start time and each transmission duration is set so that only one of the plurality of devices is transmitting at any one time during a period of time including each of the exclusive guaranteed time slots, and
    - the shared time slot is used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent guaranteed time slot.

2. The method of Claim 1, wherein the transmitting step further comprises:  
waking up by another of the plurality of devices;  
receiving, by the another of the plurality of devices, data transmitted during the transmission duration; and  
returning to sleep, after the receiving step such that the another of the plurality of devices is not receiving data and not transmitting data while sleeping, wherein  
the beacon further includes a receive indicator corresponding to another exclusive guaranteed time slot during which the another of the plurality of devices is to receive the data transmitted.

3. The method of Claim 1, wherein the reservation period comprises at least one of a random access reservation slot period and an assigned reservation slot period.

4. A wireless network comprising:  
a coordinator; and  
a plurality of devices configured to share bandwidth according to a protocol, wherein the protocol includes  
a beacon period for transmitting coordination information from the coordinator to the plurality of devices,  
a contention free period following the beacon period for providing an exclusive guaranteed time slot to each of the plurality of devices to transmit data such that only one of the plurality of devices is transmitting at any one time, and  
a shared time period following the beacon period used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent frame, wherein  
each exclusive guaranteed time slot has a respective predetermined duration, and  
the plurality of devices are sleeping when not receiving the beacon and not transmitting data such that the plurality of devices are not receiving data and not transmitting data while sleeping.

5. The wireless network of Claim 4, wherein the shared time period follows the contention free period.

6. The wireless network of Claim 4, wherein the contention free period follows the shared time period .

7. The wireless network of Claim 4, wherein the reservation period comprises at least one of a random access reservation slot period and an assigned reservation slot period.

8. The wireless network of Claim 4, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

9. A wireless network comprising:

a coordinator; and

a plurality of devices configured to share bandwidth according to a protocol, wherein the protocol includes

a beacon period for transmitting coordination information from the coordinator to the plurality of devices,

an optional contention access period following the beacon period for each of the plurality of devices to optionally transmit a control message to the coordinator and for the coordinator to transmit a control response to the control message, and

a contention free period following the optional contention access period for providing an exclusive guaranteed time slot to each of the plurality of devices to transmit data such that only one of the plurality of devices is transmitting at any one time, and

a shared time period following the beacon period used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent frame, wherein

each exclusive guaranteed time slot has a respective predetermined duration, and the plurality of devices are sleeping when not receiving the beacon, not transmitting

data, and not transmitting a control message such that the plurality of devices are not receiving data and not transmitting data while sleeping.

10. The wireless network of Claim 9, wherein the shared time period follows the contention free period.

11. The wireless network of Claim 9, wherein the contention free period follows the shared time period .

12. The wireless network of Claim 9, wherein the reservation period comprises at least one of a random access reservation slot period and an assigned reservation slot period.

13. The wireless network of Claim 9, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

14. A wireless network comprising:  
a coordinator; and  
a plurality of devices configured to share bandwidth according to a protocol, wherein the protocol includes  
a beacon period for transmitting coordination information from the coordinator to the plurality of devices,  
a contention free period following the beacon period for providing an exclusive guaranteed time slot to each of the plurality of devices to transmit data such that only one of the plurality of devices is transmitting at any one time, and  
a reservation period following the contention free period for each of the plurality of devices to optionally transmit a reservation request message to the coordinator, wherein  
each exclusive guaranteed time slot has a respective predetermined duration, and  
the plurality of devices are sleeping when not receiving the beacon, not transmitting data, and not transmitting a reservation request messages such that the plurality of devices are not receiving data and not transmitting data while sleeping.

15. The network of Claim 14, wherein the reservation period provides random access to the plurality of devices to optionally transmit a respective reservation request message.

16. The network of Claim 14, wherein the reservation period comprises an exclusive assigned reservation slot for each of the plurality of devices such that each of the plurality of devices optionally transmits a reservation request message during a corresponding exclusive assigned reservation slot.

17. The wireless network of Claim 14, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

18. A wireless network comprising:

a coordinator; and

a plurality of devices configured to share bandwidth according to a protocol, wherein the protocol includes

a beacon period for transmitting coordination information from the coordinator to the plurality of devices,

a contention free period following the beacon period for providing an exclusive guaranteed time slot to each of the plurality of devices to transmit data such that only one of the plurality of devices is transmitting at any one time, each exclusive guaranteed time slot including an exclusive reservation slot for optionally transmitting a reservation request message to the coordinator, wherein

each exclusive guaranteed time slot has a respective predetermined duration, and the plurality of devices are sleeping when not receiving the beacon, not transmitting data, and not transmitting a reservation request messages such that the plurality of devices are not receiving data and not transmitting data while sleeping.

19. The wireless network of Claim 18, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

20. A system for sharing bandwidth in a wireless network, comprising:

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a coordinator configured to transmit a beacon; and  
a plurality of devices, each including  
a receiver configured to receive the beacon, and  
a transmitter configured to transmit data during an exclusive guaranteed time slot, wherein  
the beacon includes for each of the plurality of devices  
a device-unique start time indicator corresponding to the exclusive guaranteed time slot for a preselected device of the plurality of devices to transmit data,  
a transmission duration corresponding to a duration of the exclusive guaranteed time slot, and  
a shared time slot start time indicator corresponding to a shared time slot separate from the exclusive guaranteed time slots and shared by the plurality of devices,  
the plurality of devices sleep when not receiving the beacon and not transmitting data such that the plurality of devices are not receiving data and not transmitting data while sleeping,  
each device-unique start time and each transmission duration is set so that only one of the plurality of devices is transmitting at any one time during a period of time including each of the exclusive guaranteed time slots, and  
the shared time slot is used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent guaranteed time slot.

21. The system of Claim 20, wherein:

the plurality of devices are further configured to store the device-unique start time indicator and the transmission duration in a memory of the preselected device.

22. The system of Claim 20, wherein:

the plurality of devices are further configured to wake up at a predetermined time such that another beacon can be received.

23. The system of Claim 20, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

24. A device for sharing bandwidth in a wireless network, comprising:  
a receiver configured to receive a beacon from a coordinator, and  
a transmitter configured to transmit data during an exclusive guaranteed time slot,  
wherein  
the beacon includes  
a device-unique start time indicator corresponding to the exclusive guaranteed time slot for the device to transmit data,  
a transmission duration corresponding to a duration of the exclusive guaranteed time slot, and  
a shared time slot start time indicator corresponding to a shared time slot separate from the exclusive guaranteed time slots and shared by the plurality of devices,  
the device sleeps when not receiving the beacon and not transmitting data such that the device is not receiving data and not transmitting data while sleeping,  
the device-unique start time and transmission duration are set so that no other devices of the wireless personal area network are transmitting during the exclusive guaranteed time slot during a period of time including each of the exclusive guaranteed time slots, and  
the shared time slot is used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent guaranteed time slot.

25. The device of Claim 24, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

26. A coordinator for managing the sharing of bandwidth in a wireless network, comprising:  
a transmitter configured to transmit a beacon to a plurality of devices of the wireless personal area network, wherein



the beacon includes for each of the plurality of devices

a device-unique start time indicator corresponding to an exclusive guaranteed time slot for a preselected device of the plurality of devices to transmit data,

a transmission duration corresponding to a duration of the exclusive guaranteed time slot, and

a shared time slot start time indicator corresponding to a shared time slot separate from the exclusive guaranteed time slots and shared by the plurality of devices,

the coordinator sleeps when not transmitting the beacon such that the coordinator is not receiving data and not transmitting data while sleeping, each device-unique start time and each transmission duration is set so that only one of the plurality of devices is transmitting at any one time, and

the shared time slot is used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent guaranteed time slot.

27. The coordinator of Claim 26, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

28. A computer program product, comprising:

a computer storage medium; and

a computer program code mechanism embedded in the computer storage medium for causing a computer to coordinate the sharing of bandwidth in a wireless network, the computer program code mechanism having

a first computer code device configured to generate a beacon signal to be transmitted to a plurality of devices of the wireless personal area network, the beacon including for each of the plurality of devices

a device-unique start time indicator corresponding to an exclusive guaranteed time slot for a preselected device of the plurality of devices to transmit data,

a transmission duration corresponding to a duration of the exclusive guaranteed time slot, and



a shared time slot start time indicator corresponding to a shared time slot separate from the exclusive guaranteed time slots and shared by the plurality of devices, wherein

each device-unique start time and each transmission duration being set so that only one of the plurality of devices is transmitting at any one time, and

the shared time slot is used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent guaranteed time slot.

29. The computer program product of Claim 28, wherein:

the computer program code mechanism further has,

a second computer code device configured to receive control messages from the plurality of devices and to generate control responses to be transmitted to the plurality of devices after the beacon signal has been transmitted and before the earliest of the device-unique start times.

30. The computer program product of Claim 28, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

31. A system for sharing bandwidth by a plurality of devices in a wireless network, comprising:

means for sending from a coordinator a beacon including coordination information to each of the plurality of devices, the beacon including for each of the plurality of devices

a device-unique start time indicator corresponding to an exclusive guaranteed time slot for a preselected device of the plurality of devices to transmit data,

a transmission duration corresponding to a duration of the exclusive guaranteed time slot, and

a shared time slot start time indicator corresponding to a shared time slot separate from the exclusive guaranteed time slots and shared by the plurality of devices;

means for receiving the beacon by the plurality of devices;

means for storing the device-unique start time indicator and the transmission duration

in a memory of each preselected device;

means for sleeping after device-unique start time indicators and the transmission durations have been stored such that the plurality of devices are not receiving data and not transmitting data while sleeping;

means for transmitting, by each of the plurality of devices, at respective times corresponding to the device-unique start time stored in the memory of each preselected device and for the transmission duration stored in the memory of the preselected device;

means for returning to sleep, after each of the plurality of devices has transmitted such that the plurality of devices are not receiving data and are not transmitting data while sleeping; and

means for waking up at a predetermined time such that another beacon can be received by the plurality of devices, wherein

each device-unique start time and each transmission duration is set so that only one of the plurality of devices is transmitting at any one time during a period of time including each of the exclusive guaranteed time slots, and

the shared time slot is used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the plurality of devices, a polling period managed by the coordinator for additional transmissions by the plurality of devices, and a reservation period for reserving time by the plurality of devices in a subsequent guaranteed time slot.

32. The system of Claim 31, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

33. A wireless network comprising:

a coordinator; and

a plurality of devices configured to share bandwidth according to a protocol, wherein the protocol includes

a beacon period for transmitting coordination information from the coordinator to the plurality of devices, and

a contention free period including

a guaranteed time slot period for providing an exclusive guaranteed

time slot to each of the plurality of devices to transmit data such that only one of the plurality of devices is transmitting at any one time, each exclusive guaranteed time slot having a respective predetermined duration, and

a variable time slot period for providing an exclusive variable time slot to each of the plurality of devices to transmit data in a predetermined order, each exclusive variable time slot having a respective predetermined duration based on a packet size of data to be transmitted, wherein

the plurality of devices are sleeping during the guaranteed time slot period when not transmitting data such that the plurality of devices are not receiving data and not transmitting data while sleeping, and

the variable time slot period is used as at least one of a slot cycle time division multiple access scheme period and a polling scheme period.

34. The network of Claim 33, wherein:

each of the plurality of devices sends a request to send message to the controller and receives a clear to send message from the controller prior to transmitting data in their respective exclusive variable time slot.

35. The system of Claim 33, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

36. A wireless network comprising:

a coordinator; and

at least two piconets, each including at least one device configured to share bandwidth according to a protocol, wherein

the protocol includes for each of the at least two piconets

a beacon period for transmitting coordination information from the coordinator to the at least one device of each of the at least two piconets, and

a contention free period following the beacon period for providing an exclusive guaranteed time slot to each of the at least one device of each of the at least two piconets to transmit data such that only one of the at least one device of each of the at least two piconets is transmitting at any one time, wherein

each exclusive guaranteed time slot has a respective predetermined duration,  
the contention free period includes an unused portion,

the unused portion for a first of the at least two piconets is coordinated to coincide with the beacon period, the exclusive guaranteed time slots of the contention free period, and the shared time period for a second of the at least two piconets such that the at least one device of the first of the at least two piconets do not transmit at a same time as the at least one device of the second of the at least two piconets, and

each of the at least one device of each of the at least two piconets are sleeping when not receiving the beacon and not transmitting data such that the at least one device of each of the at least two piconets are not receiving data and not transmitting data while sleeping.

37. The wireless network of Claim 36, wherein the wireless network comprises at least one of a wireless personal area network and a wireless local area network.

38. The wireless network of Claim 36, wherein:

the protocol further includes an optional contention access period following the beacon period for each of the at least one device of each of the at least two piconets to optionally transmit a control message to the coordinator and for the coordinator to transmit a control response to the control message.

39. The wireless network of Claim 36, wherein:

the protocol further includes a shared time period following the beacon period used as at least one of a slot cycle time division multiple access period managed by the coordinator for additional transmissions by the at least one device, a polling period managed by the coordinator for additional transmissions by the at least one device, and a reservation period for reserving time by the at least one device in a subsequent frame, wherein

the unused portion for a first of the at least two piconets is further coordinated to coincide with the shared time period for a second of the at least two piconets.

40. The wireless network of Claim 39, wherein the shared time period follows the contention free period.

41. The wireless network of Claim 39, wherein the contention free period follows the shared time period.

42. The wireless network of Claim 39, wherein the reservation period comprises at least one of a random access reservation slot period and an assigned reservation slot period.

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